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SUGGESTIONS FOR BETTER PLANT BREEDING AND SEED PRODUCTION WITHIN THE NON-CHERNOZEM ZONE

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In November 1966, the All-Union Order of Lenin Academy of Agricultural Sciences imeni V. I. Lenin, and the Scientific Research Agricultural Institute for the Central Districts of Non-Chernozem Zone have held a wide-scope conference. The participants -- workers at the scientific research establishments of central districts, non-chernozem zone of the RSFSR, and also of the Belorussian, Lithuanian, Latvian and Estonian SSR -- have discussed the results and objectives of plant breeding and seed production work relating to grain crops, conducted in the non-chernozem zone.

In his introductory address, Academician I. I. Sinyagin, vice-chairman of VASKhNIL (All-Union Order of Lenin Academy of Agricultural Science), pointed out that grain-crop management progress in the non-chernozem belt depends on overall agronomy growth and in particular on availability of suitable crop-plant varieties. Plant breeders, however, have not as yet devoted sufficient effort to their development specifically for this zone. Hence the farmers are forced to grow large acreages of crop-varieties developed within other zones. For example, the Mironovskaya 808 winter-wheat variety is now distributed in Belorussian SSR, in the Moscow and some other oblasts.

At the conference were presented 26 reports on pertinent problems of plant breeding and seed production concerning winter- and summer-wheat, winter rye, barley, oats and buckwheat.

N. T. Varenitsa, Corresponding Member of VASKhNIL, described the methods and results of winter-wheat breeding in the oblasts of the non-chernozem zone. He noted that in these the winter-wheat acreage is

increasing year by year. Further expansion of areas under this high-yield crop is being hindered by lack of more winter-hardy varieties, responsive to application of increased amounts of organic and mineral fertilizers and immune to rust and other diseases. This is due to the low-level and ineffective work conducted on breeding winter-wheat within the zone. As a result more than one-half of the area cropped to winter-wheat of named variety is planted with seed of varieties developed outside the zone.

Much interest was elicited by the report of the well-known plant breeder, director of the Mironovskaya Experimental Plant Breeding Station, Hero of Socialist Labor, VASKhNIL Academician V. N. Remeslo, concerning the development of such valuable varieties of winter-wheat as Mironovskaya 264 and Mironovskaya 808.

Owing to a well-organized seed production of the Mironovskaya 808 variety, all the farms within the Kiyevskaya Oblast are provided every year with selected seed from the Mironovskaya Plant Breeding Station, for planting on propagation plots. On the following year all the seed-producing stands are grown from seeds of 1st propagation, while marketable yield producing areas are seeded with those of 2nd propagation. To the collecting points is delivered marketable grain of 3rd propagation.

V. N. Remeslo described the development of a new promising winter-wheat variety -- Mironovskaya-Yubileynaya 50, which shows good winter hardiness, and has a stiff straw which prevents lodging; it is high yielding (more so than Mironovskaya 808).

Professor N. D. Mukhin, Doctor of Agricultural Sciences (of the Belorussian Scientific Research Institute of Farming), dealt in his report with the results and prospects of grain-crop plant breeding in Belorussia. In 1965 these crops occupied 53.6% of the republic's seeded area, including 30.8% in winter rye, 3.1 in winter wheat, 7 in barley, 3.5 in oats, 1.8 in buckwheat, and only 0.3% in summer wheat.

In Belorussia there have been developed adequate varieties of rye, but they do lodge when the yield is high, produce a small grain and have other undesirable characteristics. Hence in breeding of winter rye the greatest attention is now being given to development of varieties yielding large grain with a higher protein content and having short and stiff straw resistant to lodging. In the resolving of this problem the polyploidy method is of promise. In its application it is of importance not to stop at a mere doubling of chromosomes. Following the example of the Polish plant breeders one should undertake a hybridizing of tetraploid specimens of different origin, with a subsequent selection. With this method the Scientific Research Institute of Farming has developed the promising Bel'ta variety of winter rye. It is superior in yield (by more than 30%) to the popular Benyakonskaya variety; it is highly resistant to lodging and produces a large grain (the average weight of 1,000 kernels is 50 grams) characterized by high content of crude

protein. This institute has developed also other high-yield varieties: Minskaya summer wheat (widely distributed in the non-chernozem zone) and Yubileynaya 2 variety of buckwheat.

The work on development of highly winter-hardy varieties of winter wheat was described in his report by Professor V. Ye. Pisarev, Hero of Socialist Labor. He produced a number of winter wheat amphidiploids having valuable winter-hardiness characteristics, and supplied them for further plant breeding work to many scientific research installations located in districts where the winter conditions are most severe and winter-crops have not been able, so far, to survive.

Candidate of Agricultural Sciences G. D. Lapchenko related his experience with development of new winter-wheat varieties by the method of remote hybridization, namely by crossing various forms of wheat with blue wheatgrass. In this manner remarkable varieties of wheat-wheatgrass hybrids have been developed. These are the PPG 186, PPG 599 and PPG 1 varieties, which have been distributed in 18 oblasts of the RSFSR and also in other republics. These wheat varieties are characterized by high yield, early maturation, good resistance to fungus diseases and lodging; they produce a large grain of good baking quality.

Work on winter-wheat breeding conducted in the Lithuanian SSR was described in a report by I. I. Bulavas, Corresponding Member of VASKhNIL. The varieties developed at the Dotnuvskaya Station have completely displaced those of foreign origin. In 1965, fifty percent of the republic's winter wheat acreage were occupied by the Akuatuoten variety. In this report it was noted that at present there is a tendency in the Lithuanian SSR to expanding the cultivation of winter wheat, and that new and promising varieties of this crop have been developed -- the Ritas, Aydas and Muras.

Candidate of Agricultural Sciences F. G. Kondratenko (of the Agricultural Scientific Research Institute for the central districts of the non-chernozem zone) reported on the results and methods of winter rye breeding. At the institute, work is successfully progressing on the development of rye with a short and stiff straw, by hybridization of the rye-wheat Mutant (dwarf) derived from vegetative grafting of Vyatka Moskovskaya rye on winter wheat PPG 186.

Winter rye breeding and seed production in the Tatarskaya ASSR were reported to the gathering by Candidate of Biological Sciences, N. N. Makarova, head of the plant breeding division of the Tatarskaya Agricultural Experiment Station. In this republic grain crops are grown on 65% of tilled land, and of these 36% (more than 900,000 hectares) are sown in winter rye. This is the highest yielding grain crop in Tatariya. The Kazanskaya variety accounts for more than 99% of the rye acreage. It has been adopted in eight oblasts and republics of the nation.

Further work on rye breeding is directed toward development of plants with a shorter and stiffer straw and with large kernels, which are resistant to diseases and which exceed in yield the initial Kazanskaya variety in yield. At present, several promising varieties have already been developed. These are: the Kazanskaya 3, Kazanskaya 4, Kazanskaya 6 and the Tatarskaya. According to results of tests over four years, they are higher yielding than the Kazanskaya variety, by three centners per hectare; moreover, they show a better grain-to-straw ratio and are more resistant to lodging.

Doctor of Agricultural Sciences G. I. Popov (Northwestern Agricultural Scientific Research Institute), described winter rye breeding by the use of clones. As a result of cross-pollination of vegetatively propagated clones there have been developed hybrids which exhibit considerable heterosis in the first generation. On further seminal propagation the heterosis becomes gradually attenuated.

A report on the method of embryonal tissue transplantation, in the breeding of cereal plants was presented by Candidate of Biological Sciences L. A. Golovtsov, head of the plant breeding division at the Bryanskaya Oblast Agricultural Experiment Station. By the method of transplantation and selection, constant lines have been produced -- large-kernel rye, flinty and wheatlike ryes, and others. To increase the protein content of wheatlike rye, transplantation of its embryos onto the endosperm of Belotserkovskay 198 variety of wheat was tested in 1959. As a result, a tall-stem rye has been isolated. Transplantation of wheatlike rye onto the endosperm of Mironovskaya 808 has produced a broad-leaf rye. Both of these forms are characterized by a high yield and contain much protein.

The results and problems of barley and oat breeding in the oblasts of central non-chernozem area and in the Volga-Vyatka district were dealt with in the report by E. D. Nettevich. He pointed out that recently a number of experiment stations have, without justification, discontinued work on the breeding of oats -- a crop that always produces steady yields even on poor soils. The acreage of oats has been sharply reduced in this zone, while that of barley has been greatly expanded. Thus, in 1960 barley was sown on 270,000 hectares in this zone, while in 1965 the area occupied by this crop had increased to 1,137,000 hectares, or by 4.2 times. Almost throughout the entire zone (in 15 our of 17 oblasts) there has been use (as early as 1929) of the high-yielding Viner variety. In 1965 it was sown on 63% of the area on which name varieties of barley are grown. Out of the eight other varieties distributed in the zone, seven are used for brewing beer.

Breeding of barley is now conducted at four experiment stations and at the Agricultural Scientific Research Institute of the central districts of the non-chernozem zone. But none of the stations has developed a variety that is widely distributed within the zone. The principal cause of this is the frequent changes and reorganisations of

plant breeding work. The breeding of some crops has been discontinued, and that of others started anew. At the Yaroslavskaya station, for example, work on barley breeding was discontinued twice, and then taken up again within the last few years. The same thing has taken place at the Orlovskaya station.

Candidate of Biological Sciences N. F. Fesenko reported that the Orlovskaya (former Shatilovskaya) experiment station developed, at one time, the remarkable Bogatyr' variety of buckwheat, now distributed in 52 oblasts and republics throughout the nation, and sown on more than 60% of the area on which named varieties of this crop are grown. In 1954 there was released another variety developed at this station, namely Shatilovskiy 4, which is now grown in 13 oblasts. The station is now conducting work on development of buckwheat varieties that are higher yielding than the Bogatyr'.

The participants at the conference were informed on buckwheat seed production, and the significance of apiculture in this connection, by Doctor of Agricultural Sciences G. V. Kapil'kiyevskiy. He suggested that the attention of plant breeders be directed to the development of new varieties of buckwheat which produce a greater amount of nectar.

B. A. Karunin, head of the seed production division at the Agricultural Scientific Research Institute for the central districts of non-chernozem zone, presented a report on organization of plant breeding and seed production work relating to grain crops, in the northeastern districts of non-chernozem zone.

A report on methods of assessing the quality of grain was presented by Candidate of Agricultural Sciences P. N. Shibayev. The agronomical practices aimed at raising grain crop yields were described by K. S. Saranin. He emphasized the fact that average grain yields in the non-chernozem zone are very poor due to the low level of farming practices. In 1965 only 38 kilograms of effective components of mineral fertilizers were applied per hectare of tilled land. The soil-liming plan has not been fulfilled for a number of years. Even in 1966 it was fulfilled only to the extent of 67%.

In order to increase grain crop yields, farm workers in the non-chernozem zone must devote primary attention to application of organic and mineral fertilizers, and to the liming of all acid soils. A major prerequisite to yield increase is the introduction of crop rotation, and the use of high-quality seed of the best distributed varieties.

The resolution adopted at the conference outlines the steps to be taken in order to improve plant-breeding and seed-production work relating to grain crops which is being conducted in the districts of the non-chernozem zone.